ABSTRACT

An improved band pass interferometer for use as a high resolution wavelength selection unit comprising, as main elements, an input optical port (optical fiber) together with a fiber optic collimator for generating a narrow incoming collimated beam, two plane-parallel highly reflective surfaces with low reflection losses, one being totally reflective, (i.e. very little intensity of the light beam incident thereon should pass through the reflective surface,) the other being partially reflective, (i.e., a portion of a reflected light beam, more specifically its intensity, incident thereon should pass through the partially reflective surface becoming an output beam,) which splits the incoming narrow incoming collimated beam into a finite number of output beams, an optical medium located between the reflective surfaces, and a beam focusing element which collects all the output beams and focuses them into an output optical port (optical fiber). There is also provided a refractive index adjuster, such as, e.g., an electro-optical element, that changes the refractive index of the optical medium between the reflective surfaces using, preferably, an electro-optical control voltage. There is further provided an adjustable spacer, such as, e.g., a piezo-electrical element, that changes the spacing between the reflective surfaces using, preferably, a piezo-electric control voltage. The coherent beam emerging from the input port is collimated and is sent to two parallel reflective surfaces, one totally reflective, the other partially reflective, generating in this way a finite number of output beams, which are collected and focused into a focused spot by a converging element, usually a lens system. At the recombination point, which is the entrance aperture into the output optical port, all the multiple beams generated by the two mirrors setup, interfere. The output beam resulting from the interference of those multiple output beams is available as the output beam of the device. The transmission function, which is the ratio between the intensity available at the output port versus the intensity at the input port, strongly depends on the phase shift introduced between the multiple output beams by the beam-splitting element, realized with the two mirrors. The tuning principle of the said interferometer is to select only one wavelength at its output by changing either the spacing between the mirrors using the Piezo-electric control voltage or the refractive index of the media between them using the electro-optical control voltage, which leads to a shifting of the transmission maximum into a broad wavelength range, keeping also very good insertion loss or transmission efficiency for the selected wavelength and a constant bandwidth in the whole working range.